TITLE OF THE INVENTION

A SYSTEM TO REPLACE A PHOTOSENSITIVE UNIT AND A TRANSFER UNIT AND A PRINTER HAVING THE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority of Korean Patent Application No. 2003-45525, filed on July 5, 2003, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a system to replace a photosensitive unit and a transfer unit, and a printer using the system.

2. Description of the Related Art

[0003] In general, a printer or a copier includes a photosensitive unit which develops an image, and a transfer unit which transfers the developed image onto paper. However, when the photosensitive unit and the transfer unit are used for a long time, the quality of the image is gradually lowered. Thus, when an expected life span of the photosensitive unit and the transfer unit has elapsed, the units should be replaced so that a clean image can be developed continuously.

[0004] FIGS. 1 through 5 illustrate a conventional system for replacing a photosensitive unit and a transfer unit in a printer.

[0005] Referring to FIGS. 1 through 5, a photosensitive unit 10 and a transfer unit 20 are supported to slide along first and second guide rails 41 and 42, respectively, provided inside a printer. In order to replace the photosensitive unit 10 and the transfer unit 20 with new units, first, a door (not shown) provided on a front surface of the printer is opened, and a locking lever 30, which locks the photosensitive unit 10, is pushed, as shown in FIG. 2. In this case, the locking lever 30 lifts the transfer unit 20 by a predetermined height such that the transfer unit 20 is separated from the photosensitive unit 10. Then, as shown in FIG. 3, a handle 11 of the photosensitive unit 10 is grasped, and the photosensitive unit 10 is pulled along the first guide rail 41 to be removed from the printer. Thereafter, as shown in FIG. 4, the locking lever 30 is

lowered in an original location. As shown in FIG. 5, a first handle 21 of the transfer unit 20 is grasped, and the transfer unit 20 is pulled along the second guide rail 42 to be removed from the printer. In this case, when the transfer unit 21 is removed to some degree, a second handle 22, installed on a top surface of the transfer unit 20, is pulled and grasped so that the transfer unit 20 does not fall. Thereafter, mounting a new unit is performed in a reverse order.

[0006] However, in such a replacing system, whenever the photosensitive unit 10 and the transfer unit 20 are removed or installed, the locking lever 30 should be repeatedly lowered or lifted. In addition, since each of the photosensitive unit 10 and the transfer unit 20 is grasped, pulled, and removed from the printer, the photosensitive unit 10 and the transfer unit 20 may fall down and become damaged if they deviate from the first and second guide rails 41 and 42 and are removed carelessly while operating.

SUMMARY OF THE INVENTION

[0007] In order to solve the foregoing and/or other ptroblems, it is an aspect of the present invention to provide a system to replace a photosensitive unit and a transfer unit in a printer by which replacing the photosensitive unit and the transfer unit can be safely and easily performed, and a printer having the system.

[0008] Additional aspects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0009] The foregoing and/or other aspects of the present inventionmay be achieved by providing a system to replace a photosensitive unit and a transfer unit in a printer, the system comprising a frame provided in a printer body, and a locking unit to be provided in the frame and to simultaneously lock and unlock the photosensitive unit and the transfer unit that enter the printer via an entrance of the printer body to be seated in a mounting location.

[0010] The foregoing and/or other aspects of the present inventionmay also be achieved by providing a printer comprising a photosensitive unit to form an image to be printed through exposure and development operations, a transfer unit which transfers the image formed on the photosensitive unit onto paper, and a system to replace the photosensitive unit and the transfer unit, wherein the system includes a frame provided in a printer body, and a locking unit, which is provided in the frame and simultaneously locks and unlocks the photosensitive unit and the

transfer unit that enter the printer via an entrance of the printer body and are seated in a mounting location

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] These and/or other aspects and advantages of the present invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

[0012] FIGS. 1 through 5 illustrate a conventional system for replacing a photosensitive unit and a transfer unit;

[0013] FIG. 6 illustrates a system to replace a photosensitive unit and a transfer unit, according to the present invention; and

[0014] FIGS. 7 through 11 illustrate a method of replacing a photosensitive unit and a transfer unit using the system shown in FIG. 6, according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

[0016] FIGS. 6 through 11 illustrate a system to replace a photosensitive unit and a transfer unit, according to the present invention.

[0017] Referring to FIG. 6, an entrance, which is opened and closed by a door 320, is formed in an upward direction of a mounting portion of a printer body 300 in which a photosensitive unit 100 and a transfer unit 200 are to be mounted. Replacement of the photosensitive unit 100 and the transfer unit 200 is performed via the entrance. In addition, one or more frames 310 are installed in the mounting portion of the printer body 300, and first and second guide rails 331 and 332 are provided in each frame 310. A first guide protrusion 130 of the photosensitive unit 100 and a first guide protrusion 231 of the transfer unit 200, which enter from an upward direction to a downward direction via the entrance, are guided along the first

guide rail 331. A second guide protrusion 232 of the transfer unit 200 is guided along the second guide rail 332.

[0018] The photosensitive unit 100 includes a photosensitive drum 110, a case 150 that covers a part of the photosensitive drum 110, and a handle 120. The handle 120 is rotatably coupled with the case 150. Thus, the handle 120 is pulled up from an original location when the photosensitive unit 100 is lifted, and is pushed down to the original location after an operation of replacing the photosensitive unit 100 is performed. The photosensitive unit 100 further includes a damping member 140 including a spring 142 and a shock-absorbing bar 141. The damping member 140 elastically supports the transfer unit 200, which is to be directly placed on the photosensitive unit 100 inside the printer body 300.

[0019] The transfer unit 200 includes a case 210 which covers a transfer belt (not shown), and a handle 220 which is installed on a top surface of the case 210. A bottom surface of the case 210 is opened to access the photosensitive drum 110 and paper (not shown). In addition, the handle 220 is rotatably installed in the case 210. When the handle 220 is not used, it is folded to be closely attached to the case 210.

[0020] Referring to FIGS. 6 -11, the system further includes two locking units installed in the respective frames 310 to lock the photosensitive unit 100 and the transfer unit 200, which are mounted in the printer body 300 along the first and second guide rails 331 and 332 in place. The two locking units face each other. That is, the locking units are symmetrical. Each locking unit includes a rotating lever 341 which is rotatably operated by a user to be rotated by hand to control a first locking portion 341a formed to lock the transfer unit 200 so that the transfer unit 200 does not deviate from the first guide protrusion 231.

[0021] If the photosensitive unit 100 and the transfer unit 200 are mounted in the printer body 300 along the first and second guide rails 331 and 332 and then the rotating lever 341 is rotated, the first locking portion 341a of the rotating lever 341 covers the first guide protrusion 231 of the transfer unit 200 to lock the transfer unit 200 in place. In this case, the transfer unit 200 presses the damping member 140. The photosensitive unit 100 is locked in place by a pressure applied upwards by the damping member 140 being pressed downward by the transfer unit 200 in a state where the first guide protrusion 130 of the photosensitive unit 100 is seated on a lower seating portion 331a. Thus, by operating the rotating lever 341, the transfer unit 200 and the photosensitive unit 100 are simultaneously locked in place. A spring 344 elastically

biases the rotating lever 341 in an unlocking direction. However, unless the user rotates the rotating lever 341 in the unlocking direction, the rotating lever 341 is maintained in a locked position by a reaction force of the damping member 140 in spite of an elastic force of the spring 344.

[0022] The locking unit may further include a rotating cam 342, which is rotatably installed in the frame 310 to lock the photosensitive unit 100 seated on the lower seating portion 331a in place, and a connection bar 343, which connects the rotating lever 341 and the rotating cam 342 so that they move together in one direction of the locking direction and the unlocking direction. The rotating cam 342 includes a rail portion 342a connected to the first guide rail 331 and a second locking portion 342b which locks the photosensitive unit 100 in place by pressing the guide protrusion 130 of the photosensitive unit 100.

[0023] The locking unit may further include a lever shaft 341c about which the rotating lever 341 rotates, a cam protrusion 342c formed on the rotating cam 342, a cam stopper 342d formed on the frame 310 to lock the cam protrusion 342c when the second locking portion 342b locks the first guide protrusion 130 of the photosensitive unit 100, and a cam shaft 342e about which the rotating cam 342 rotates according to a movement of the rotating lever 342, as shown in FIGS. 7 and 11.

[0024] If the photosensitive unit 100 and the transfer unit 200 are mounted in the printer body 300 along the first and second guide rails 331 and 332, and then the rotating lever 341 is rotated, the second locking portion 342b of the rotating cam 342 lowers the first guide protrusion 130 of the photosensitive unit 100 to lock the photosensitive unit 100 in place. Simultaneously, the first locking portion 341a of the rotating lever 341 covers the first guide protrusion 231 of the transfer unit 200 to lock the transfer unit 200 in place. A locked state of each of the locking units is maintained in spite of the elastic force of the spring 344 since the guide protrusion 130 pushes the second locking portion 342b upward in response to a downward force from the second locking portion 342b of the rotating cam 342when the second locking portion 342b of the rotating cam 342 presses the first guide protrusion 130 of the photosensitive unit 100 toward the lower seating portion 331a, so that the rotating cam 342 does not rotate in response to the reaction force of the first guide protrusion 130. However, when the user slightly rotates the rotating lever 341 in the unlocking direction while the locking units are in this state, the rotating cam 342 returns to an unlocking state due to a restoration force of the spring 344 while rotating. Therefore, the guide protrusion of the photosensitive unit 100 and the first guide protrusion 231

of the transfer unit 200 are released from the second locking portion 342b of the rotating cam 342 and the rotating lever 341, respectively.

[0025] Meanwhile, an auxiliary locking unit, which locks the second guide protrusion 232 of the transfer unit 200, is installed on the second guide rail 332. The auxiliary locking unit includes an interference lever 345 which is rotatably installed in the frame 310, and a spring 346 which elastically biases the interference lever 345 so that a free end 345a of the interference lever 345 can protrude toward the second guide rail 332. A slant surface 347, on which the second guide protrusion 232 smoothly moves along the second guide rail 332 when the transfer unit 200 is mounted in the second guide rail 332, is formed on the free end 345a of the interference lever 345. A stepped surface 348, which prevents the transfer unit 200 from coming out of the printer body 300, is formed on the free end 345a of the interference lever 345. Thus, as shown in FIG. 9, the free end 345a of the interference lever 345 allows the transfer unit 200 to enter along the second guide rail 332. However, as shown in FIG. 10, after the transfer unit 200 is seated on the second guide rail 332, the free end 345a of the interference lever 345 interferes with the second guide protrusion 232 of the transfer unit 200 in a direction in which the transfer unit 200 is to be removed again from the printer body 300. Thus, in order to remove the transfer unit 200 from the printer body 300 at this point, the first guide protrusion 231 of the transfer unit 200 is lifted into a state shown in FIG. 9, and then is pulled along the second guide rail 332, so that interference between the interference lever 345 and the second guide protrusion 232 of the transfer unit 200 is prevented. The interference lever 345 is installed and operated as described above in order to prevent a friction scratch from occurring on both the photosensitive unit 100 and a transfer belt (not shown) when the transfer unit 200 is pulled out from the printer body 300. The friction scratch may occur both on the photosensitive drum 110 and the transfer belt if the transfer unit 200 is pulled out of the printer body 300 without changing the state where the photosensitive drum 110 contacts the transfer belt (not shown) after the transfer unit 200 is mounted in the printer body 300. Thus, the auxiliary locking unit acts as a safeguard to protect the photosensitive drum 110 and the transfer belt. The auxiliary locking unit allows the transfer unit 200 to be pulled out and removed from the printer body 300 only when the first guide protrusion 231 of the transfer unit 200 is lifted and the photosensitive drum 110 is separated from the transfer belt (not shown).

[0026] Hereinafter, when the locking unit includes the rotating lever 341, the rotating cam 342, and the connection bar 343, an operation of mounting and removing the photosensitive unit 100 and the transfer unit 200 in the printer body 300 and from the printer body 300, respectively,

will be described.

[0027] In the above structure, when a new photosensitive unit 100 and transfer unit 200 are mounted in the printer body 300, the door 320 may be opened, and the new photosensitive unit 100 then can enter the printer body 300 via the upward entrance opened by the door 320, as shown in FIG. 7. As such, the first guide protrusion 130 of the photosensitive unit 100 slides along the first guide rail 331 and is guided into a mounting location. In this case, the rotating cam 342 is in an unlocking state and is connected to the first guide rail 331 so that the rail 342a does not prevent the guide protrusion 130 from entering into the lower seating portion 331a. In this way, the first guide protrusion 130 of the photosensitive unit 100, lowered along the first guide rail 331, is seated on the lower seating portion 331a, as shown in FIG. 8.

[0028] Next, the transfer unit 300 enters into the printer body 300 in the order shown in FIGS. 8 through 10. First, the second guide protrusion 232 of the transfer unit 200 slides along the second guide rail 332 to be disposed into the mounting location. In this case, the second guide protrusion 232 passes across the free end 345a of the interference lever 345 to enter an end of the second guide rail 332 disposed in the mounting location, as shown in FIG. 9.

[0029] When the second guide protrusion 232 enters completely into the mounting location, the first guide protrusion 231 enters into the first guide rail 331 and is seated on an upper seating portion 331b of the first guide rail 331, as shown in FIG. 10. As such, mounting the photosensitive unit 100 and the transfer unit 200 in the printer body 300 is completed. Subsequently, a locking operation of the two units 100 and 200 is performed. The locking operation is performed by rotating the rotating lever 341 of the locking unit. In other words, as shown in FIG. 11, if the user rotates the rotating lever 341 into a locked state, the first locking portion 341a of the rotating lever 341 covers the first guide protrusion 231 of the transfer unit 200 to prevent the transfer unit 200 from deviating from an upward direction, and the second locking portion 342b of the rotating cam 342 presses the first guide protrusion 130 of the photosensitive unit 100 toward the lower seating portion 331 to lock the photosensitive unit 100 in place. Thus, as long as the rotating lever 341 is not returned to its original location, the two units 100 and 200 are maintained in a stable locked state by the locking unit.

[0030] When these units 100 and 200 are removed from the printer body 300, the door 320 is opened to allow a user to access the units 100 and 200 through the entrance of the printer body 300 in a vertical direction, i.e., in an upward or downward direction, the rotating lever 341 is

rotated in the unlocking state which is an original location, and then, the transfer unit 200 and the photosensitive unit 100 are sequentially removed from the printer body 300.

[0031] Since operations of locking and unlocking the photosensitive unit 100 and the transfer unit 200 are simultaneously performed by opening the door 320 and rotating the rotating lever 341, the operation of replacing the photosensitive unit 100 and the transfer unit 200 can be more conveniently performed as compared to a conventional printer in which a photosensitive unit and a transfer unit are replaced through an opening formed on a side of the conventional printer body. In addition, since the two units 100 and 200 are lifted in an upward direction and removed in a state where the handles 120 and 220 provided on each of the units 100 and 200 are grasped, compared to the conventional method of replacing the photosensitive unit 10 and the transfer unit 20 by grasping front sides of the two units 10 and 20, pulling the units out in a forward direction, i.e., a horizontal direction, and removing them, the possibility that the two units 100 and 200 fall down and become damaged is reduced.

[0032] As described above, in the system to replace a photosensitive unit and a transfer unit, the operations of locking and unlocking the two units are simultaneously performed by rotating a rotating lever, and then the two units enter into the printer body 300 via an upward entrance. As such, an operation of replacing the photosensitive unit and the transfer unit is more conveniently and stably performed.

[0033] While this invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims and equivalents thereof.